

Measles Vaccination Effectiveness and Major Risk Factors Associated with Measles Among Children Presenting to Tertiary Care Hospitals of Peshawar City, Pakistan. A Matched Case Control Study

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ABSTRACT

Background: In Pakistan annually 2.1 million children develop Measles infection and more than 19,000 suffer with disease fatality or complications. Despite the fact that measles vaccine is easily available and already included in Expanded program on immunization (EPI) free of cost, Measles is still a leading cause of death among children in Pakistan.

Objectives: To determine measles vaccination effectiveness and major risk factors associated with the development of measles among children less than five years of age presenting to the tertiary care hospitals of Peshawar city. **Methods:** It was a matched case control study. Cases were children less than five years of age presenting to the hospitals with measles infection. Controls were selected from the same hospitals without measles. Cases and control with a ratio of 1:1 were matched for age and gender. **Results:** A total sample size of 206 (103 cases & 103 controls) age and gender matched were enrolled by a non-probability sampling technique. Measles cases were less likely to received vaccination at 9th months and 12 – 24th month [mOR: 0.96, 95% CI: 0.58-1.62] and [mOR: 0.92, 95% CI: 0.36-1.58] respectively. Children with measles were also less likely to be given breast milk in the initial two years of life. [OR: 0.94, 95% CI, 0.37-1.73]. Children with measles infection had a higher chance to be malnourished with mOR of 1.54, 95% CI: 1.17-2.30. **Conclusion:** There is a need for organised efforts to identify the gaps in expanded program on immunization (EPI) coverage. Awareness among the parents regarding the full doses of measles vaccination and breastfeeding feeding in the initial two years of child birth is essential to enhance the child's immunity against the preventable diseases specially measles.

Keywords: Measles, Vaccination, Breastfeeding, Risk factors, Malnutrition.

INTRODUCTION

Measles infection is highly contagious caused by a virus in the paramyxovirus family and transmitted by air borne droplet produced during coughing or sneezing.^[1]

Measles caused an estimated 2.6 million deaths each year before the introduction of measles vaccine in 1963. The disease remains one of the leading causes of death among young children worldwide specially in Africa and south Asian countries. In 2016, Approximately 89,780 young children (mostly under the age of 5 years) died of measles.^[1]

Despite the fact that measles vaccine is easily available and already included in Expanded program

on immunization (EPI) free of cost, Measles is still a leading cause of death among children in Pakistan.^[2,4]

In Pakistan annually 2.1 million children develop Measles infection and more than 19,000 suffer with disease fatality or complications.^[2]

Pakistan is included among World Health Organization's 47 high priority regions for Measles control. A total number of 6,494 measles cases were reported in 2017, which is more than double those reported in 2016 according to WHO report.^[3] The report also revealed that more than 65 % of cases reported in the eastern Mediterranean region were from Pakistan followed by Afghanistan and Syria at 1,511 and 513 cases of measles respectively.^[3]

In developed countries, high vaccine coverage more than 80%, two-dose vaccine approach and a decent surveillance system have greatly reduced their Measles burden.^[2]

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Malnutrition, low immunization coverage, missed booster dose and low vaccine efficacy due to cold chain related problems are the reasons that cause measles endemic in Pakistan.^[4] According to National Institute of Health report 2017 the peak incidence period in Pakistan is during April and May.^[5]

The aim of this study is determine measles vaccination effectiveness and major risk factors associated with the development of measles among children less than five years of age presenting to the tertiary care hospitals of Peshawar city.

Current literature helps to form a general model of intervention, however local data regarding risk factors and vaccine effectiveness for measles among children is required to tailor a region specific intervention mode.

MATERIALS AND METHODS

It was a matched case control study. Cases were children less than 5 years of age presenting to the hospital with measles infection. Controls were selected from the same hospital without measles. Cases and control with a ratio of 1:1 were matched for age and gender.

A total sample size of 206 with 103 children with Measles and 103 children with medical problems other than Measles were enrolled by non-probability consecutive sampling technique.

The study subjects were enrolled from the outpatient and inpatient paediatric department of four main tertiary care hospital of Peshawar city (Kuwait teaching hospital, Lady reading hospital, Khyber teaching hospital, Hayatabad medical complex).

Permission to carry out study were taken from the Hospital administration. Informed consent were obtained from the parents of the children.

Cases were confirmed case of measles infection with a generalized rash with cough or coryza, conjunctivitis and a temperature equal to or more than 101°F. Controls were children presenting to the same hospitals with a disease other than measles. Cases with polio, pertussis were excluded to avoid probability of nosocomial transmission of Measles. Surgical case, children with gross congenital anomalies and parents reluctant to give informed consent were also excluded.

A data was collected on a structured questionnaire which were divided in to three main sections: Socio-demographic characteristics, nutritional anthropometric measurement and measles disease characteristics as per IMNCI guidelines.

Analysis plan

Data obtained were entered and analysed in SPSS version 20.0. Univariate conditional logistic regression analysis was carried out to estimate the crude matched Odds Ratios with 95% Confidence Intervals. A P-value of less than 0.05 were considered significant.

RESULTS

Socio-demographic characteristics of measles cases and controls are presented in [Table 1].

Among the total 206 participants (103 cases and 103 controls), 132 (64%) were male children while 74 (36%) were female children.

Table 1: Socio-demographic characteristics

	Cases n (%)	Control n (%)	Total n (%)
Age			
Mean Age in months	16.53	15.77	16.20 (100%)
Median Age in months	12	11	11.5 (100%)
Gender			
Male	66 (64%)	66 (64%)	132 (64%)
Female	37 (36%)	37 (36%)	74 (36%)
Mother's job status			
Employed	1 (1%)	1 (1%)	2 (1%)
House wife	102 (99%)	102 (99%)	204 (99%)
Father's education level			
No education	51 (49.5%)	42 (40.8%)	93 (45%)
Primary level	21 (20.4%)	27 (26.2%)	48 (23.3%)
Secondary level	19 (18.4%)	21 (20.4%)	40 (19.4%)
Graduation level	9 (8.7%)	9 (8.7%)	18 (8.7%)
Master level	3 (2.9%)	4 (3.9%)	7 (3.3%)
Mother's education level			
No education	82 (79.6%)	75 (72.8%)	157(76.2%)
Primary level	14 (13.6%)	11 (10.7%)	25(12.1%)
Secondary level	5 (4.9%)	12 (11.7%)	17(8.2%)
Graduation level	2 (1.9%)	3 (2.9%)	5(2.4%)
Master level	0 (0%)	2 (1.9%)	2(0.9%)
Total	103 (100%)	103 (100%)	206 (100%)

Table 2: vaccination, breastfeeding and malnutrition status of cases and their matched control along with matched odd ratio with 95% confidence interval and their P value.

Variable	Cases n (%)	Control n (%)	Total	Matched OR (95%CI)	P-value
Vaccination					
Received measles vaccine at 9 months					
Yes	35 (34%)	37 (35%)	72 (35%)	0.96 (0.58-1.62)	>0.05
No	68 (66%)	67 (65%)	131 (65%)		
Received measles vaccine at 12-24 months					
Yes	15 (15%)	19 (18%)	34 (17%)	0.92 (0.36-1.58)	>0.05
No	88 (85%)	84 (82%)	172 (83%)		
Breastfeeding					
Yes	86 (83%)	89 (86%)	175 (85%)	0.94 (0.37-1.73)	<0.05
No	17 (17%)	14 (14%)	31 (15%)		
Children Malnutrition status					
Malnourished	49 (47.5%)	27 (26.2%)	76 (36.8%)	1.54 (1.17-2.30)	<0.05
Normal	54 (52.4%)	76 (73.7%)	130 (63.2%)		

The mean age was recorded 16.2 month (cases: 16.53 and control: 15.77). Majority of the children's mothers were house wives (99%). Most of the children's parents had no education (fathers: 45%, mothers: 76%)

Matched Odds Ratio (mOR) with 95% Confidence Intervals (CI) for potential risk factors like not vaccinated, not breastfed and malnutrition were evaluated for their association with Measles [Tables 2].

Measles cases were less likely to received vaccination at 9th months and 12 – 24th month [mOR: 0.96, 95% CI: 0.58-1.62] and [mOR: 0.92, 95% CI: 0.36-1.58] respectively. Children with measles were also less likely to be given breast milk in the initial two years of life. [OR: 0.94, 95% CI, 0.37-1.73].

Children with measles infection had a higher chance to be malnourished with mOR compared to normal with an mOR of 1.54, 95% CI: 1.17-2.30.

DISCUSSION

The purpose of this study was to identify measles vaccination effectiveness and potential risk factors for their association with Measles in children under five years of age presenting to different tertiary-care hospitals in Peshawar city.

This study looked at the child's mother and father education level. Among the total 206 participants, majority of the children's parents (mothers: 76.2% and fathers: 45%) had no education. When compared cases with controls, illiteracy rate was high among the mothers of the measles cases (79.6%) compared with controls (72.8%). Well established research already suggests that maternal education has significant effect in reducing child morbidity and mortality and even minimum level of education significantly improves child survival rate.^[6]

In this study measles cases were negatively associated with breastfeeding with an adjusted odd ratio of 0.94 (95% CI 0.37-1.73). A study done by Silfverdal et al, 2009 have shown that measles cases were less likely to be given breastfeeding after adjustment for social class and overcrowding and gender with an odds ratio of 0.69 (95% CI 0.60 - 0.81) compared with those who never breastfed.^[7]

Zahidi et al, 2014 revealed that measles cases were more likely to have never received breast-feeding [adjusted mOR: 2.6, 95% CI 1.0 - 7.0].^[2]

Expanded Program on Immunization of Pakistan aims to attain at least 90% target of routine vaccination coverage of all EPI vaccines including measles vaccine.^[8] However, Measles vaccination coverage in this study was identified only 35% for the first dose at 9th month and 17% for the booster dose at 12-24th month of child age.

Measles cases were also negatively associated with measles vaccination at 9th months and 12-24th months with an adjusted odd ratio of 0.96 (95% CI: 0.58-1.62) and 0.92 (95% CI: 0.36-1.58) respectively. Literature has already reported that Measles vaccination was highly associated with low risk for Measles [OR: 0.14 (0.13 - 0.16)].^[9,10]

Zahidi et al, 2014 also reported that measles cases were also more likely to have never received vaccination adjusted [mOR: 10.1, 95% CI 4.5 - 22.5] and having no other children vaccinated at home adjusted [mOR: 3, 95% CI 1.5 - 5.3].^[2]

Regarding the nutritional status of children in our study, it was identified that children with malnutrition had a higher chance or 1.5 times likely to have measles infection compared to controls with an mOR of 1.54, 95% CI: 1.17-2.30. Large scale studies reported that measles infection were the reason of 44.8% of deaths among malnourished children.^[11]

Another study done by Qaisar et al 2009 in Pakistan on "comparison of measles complications in well-nourished and mal-nourished children" reported that 51% of the measles patients were malnourished.

CONCLUSION

Our study identified less measles vaccination coverage for both doses (first dose: 35% and second dose: 17%) also measles cases were positively associated with malnutrition and less breastfeeding. There is a need for organised efforts to identify the gaps in expanded program on immunization (EPI) coverage and to reduce the missed immunization in all healthcare facilities throughout the country. Awareness among the parents regarding the full doses of measles vaccination and breastfeeding

feeding in the initial two years of child birth is essential to enhance the child's immunity against the preventable diseases specially measles.

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